THE LATE QUATERNARY ENVIRONMENT OF TASMANIA AS A BACKDROP TO MAN'S OCCUPANCE

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by

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ABSTRACT

Three sites which record the presence of Pleistocene age man are now known in Tasmania. A basal ^{14}C date of 22,750 ± 420 BP (ANU-1498) (Bowdler, 1975) for the oldest site shows that aboriginal man arrived in Tasmania prior to the maximum of the Last Glaciation which occurred ∿ 18-20,000 BP. Migrating across the Bass Strait lowlands, which were produced by the glacial lowering of sea level to > 90 m, he entered the cool to cold dry predominantly grassland environment of northwestern Tasmania in which shallow lakes and swamps occurred. There were probably also local areas of open *Eucalyptus* woodlands or *Eucalyptus* savannahs. In the relatively open environment slope mantles were formed and moved downslope by strong frost action during winter, and sandy surfaces were deflated by strong dry winds during summer to produce terrestrial dunes.

The dry areas of southern midland and lowland southeastern Tasmania appear to have been steppe-grasslands between ∿ 20,000 and 10,000 BP, while extensive alpine grasslands and herbfields occurred on the mountains of southwestern Tasmania. The effects of periglacial processes of erosion and deposition produced screes, blockfields, blockstreams, and widespread gelifluction deposits in the uplands, with local occurrences of gelifluction deposits, rhythmically stratified screes and *grèzes litées* on steep slopes in lowland areas. After 12,000-10,000 BP there was major expansion of both sclerophyll and temperate rainforests and a marked reduction in the extent of open environments. Climate became warmer and moister. Geomorphological processes became less effective and slope mantles and sandy surfaces became stabilised. The impact of aboriginal man especially through burning produced local surface instability on slopes and in sandy areas. Localised, yet widespread, aboriginal disturbance of the vegetation and ground surface seems to have contributed to the alluviation of valley floors and remobilisation of surface sands on inhabited dune sites.

INTRODUCTION

Archaeological investigations by Bowdler (1974a, 1974b, 1975) on Hunter Island in northwestern Tasmania demonstrate that aboriginal man migrated across the Bass Plain land bridge during the Pleistocene and had inhabited a cave at Cave Bay on the eastern side of Hunter Island by 22,750 ± 420 BP (ANU-1498) (Figure 1). Geomorphological investigations at Old Beach in the lower Derwent Valley of southeastern Tasmania (Sigleo and Colhoun, 1975) showed that man migrated to the lower Derwent Valley during the Pleistocene, probably between ∿ 20,000 and 10,000 years ago. Goede and Murray (1976) have further extended the range of Pleistocene man in Tasmania by showing that he was present in the Florentine Valley around 12,600 ± 200 BP (R5001/4).

This new evidence for the antiquity of man in Tasmania indicates that he had arrived by the maximum stage of the Last Glaciation and that he crossed the present Bass Strait by dry land when sea level was 90 m or more below present level. This evidence points to the probability of ultimately being able to demonstrate that the occupation by aboriginal man of the present island of Tasmania is almost as ancient as the occupation of adjacent mainland southeastern Australia.

This paper will briefly review some of the biogeographic and geomorphological evidence which informs us of the type of environment into which man migrated and the subsequent major changes which the environment has experienced since his arrival. The evidence comes chiefly from northwestern and southeastern Tasmania.

Aboriginal man migrated southward to Tasmania from southeastern Australia when the climate was much colder than present; during or preceding the maximum stage of the Last Glaciation which has been estimated from ^{14}C dates at Henty Bridge as having occurred at ∿ 18-20,000 BP. Between ∿ 25,000 and 10,000 BP the Central Plateau, the Cradle Mountain area and the central part of the West Coast Ranges had extensive ice cover and many of the mountain ranges of southwestern Tasmania had cirque and valley glaciers (Davies, 1967; McPhail and Peterson, 1975). These glacial systems were formed and nourished by prevalent moist westerly and southwesterly maritime airstreams at a time when mean annual temperatures have been variously estimated as being 5°C, 6.5°C and 8°C lower than present annual average temperatures which are 10-13°C on low ground decreasing to below 5°C on mountains of over 1,300 m (Davies, 1967; Derbyshire, 1973; Colhoun, 1975). After the maritime airflows had shed most of their moisture on the western mountains and Central Plateau they were adiabatically warmed and dried on descending to the midland valley and broken hilly country of eastern Tasmania. As a consequence during the Last Glaciation, as today, there was a very sharp decrease in precipitation over the eastern part of the Central Plateau and the western part of the midlands. A similar decline in precipitation gradient also occurs northwards from a line connecting Smithton with the Great Western Tiers to the lowland coastal regions of northwestern Tasmania. During the Last Glaciation the gradient of decline was much steeper than it is today. This was due to the increased continentality of the northern lowland regions consequent upon the lowering of sea level which almost doubled the land area of Tasmania. The Bass Strait lowlands also shared this cool to cold relatively dry continental climate which extended from Victoria via northern and midland Tasmania to the lower Derwent Valley where the thin end of Australia's former "Patagonian Wedge" terminated.

NORTHWESTERN TASMANIA

Palynological work is currently in progress on a 470 cm section of late Quaternary lake marl and swamp peat deposits from Pulbeena Swamp, Irishtown (Figure 1) (Colhoun and van de Geer). Lack of any erosional hiatus in the sediment suggests that deposition has probably been continuous as the local conditions fluctuated between lake and swamp conditions over a long period of time. Analysis to date shows that in the upper 215 cm, which represents approximately the last 50,000 years,[1] the dominant elements in the vegetation changed as follows:

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[1] Estimates of age are based on ^{14}C dates by Gill and Banks (1956) and Banks, Colhoun and van de Geer (1976) from adjacent sections at Pulbeena and on ^{14}C assays supplied by Groningen University Radiocarbon Laboratory.

Depth 0 - 60 cm Humid Climate	Expansion and dominance of *Eucalyptus* spp. (6-41%) as the regional vegetation, with *Leptospermum* (38-73%) and *Melaleuca* spp. (0-11%) as local damp site components. Occasional pollen grains of long distance transported rainforest species (< 1%). No aquatic element.
~ 13,000 BP	
70 - 150 cm Drier Climate	Expansion and dominance of Gramineae spp. (68-75%), with subsidiary Compositae spp. (3-31%) as the regional vegetation. Rare *Eucalyptus* pollen (0-7%). No rainforest element. A few aquatics present between 120 - 140 cm.
~ 40,000 BP	
160 - 215 cm Humid Climate	Expansion of *Eucalyptus* spp. (8-35%) to co-dominance with Gramineae spp. (7-38%) as the regional vegetation. *Leptospermum* (9-18%), Cyperaceae (16-40%) and Restionaceae spp. (4-25%) abundant as local damp site components. Occasional pollen grains of long distance transported rainforest species (c.1%). Abundant aquatics between 160 - 180 cm.

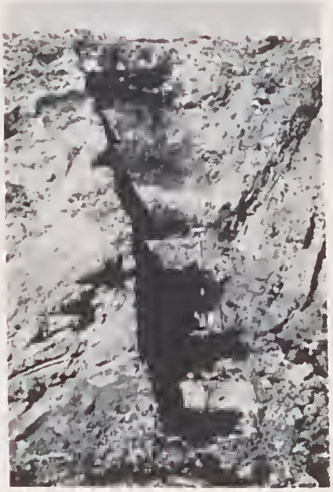

Figure 1 Section in late Quaternary algal and shell marls with swamp peats at Pulbeena, near Smithton.

The results indicate that at the time of man's first recorded presence (22,750 ± 420 years BP) the regional vegetation of northwestern Tasmania was a grassland with local patches of shrubs and *Eucalyptus* woodland present. After ~ 13,000 BP there was virtually complete replacement of the grassland by *Eucalyptus* forest on dry sites with *Leptospermum* and *Melaleuca* scrub on damp or swampy sites with high water tables. This major vegetation change is interpreted as having been caused by a change from colder drier glacial conditions to warmer moister postglacial climatic conditions.

There is little other palynological evidence available from northwestern Tasmanian although at Rocky Cape the basal beds of quartzite alluvial fan gravels reveal organic horizons that contain wood and charcoal, and a thin paleosol with roots in growth position (Figure 2).

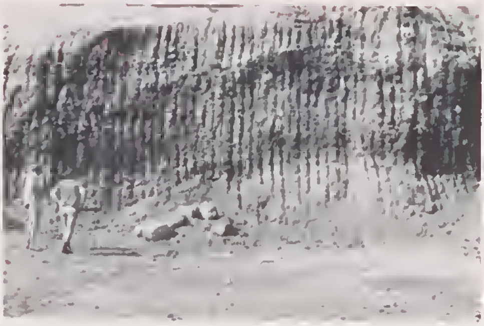

Figure 2 Alluvial fan gravels at Rocky Cape showing thin organic paleosol to the left of the staff. Wood from the paleosol gave a ^{14}C age of 24,090 ± 1,030 BP (GaK-5155).

^{14}C dates from ~ 32,000 to ~ 24,000 BP have been obtained from this site and pollen spectra show that the regional vegetation consisted mainly of *Eucalyptus*, Gramineae and Compositae spp. At Rocky Cape light *Eucalyptus* woodland or *Eucalyptus* savannah seems to have been the regional vegetation prior to the phase of maximum cold and aridity during the Last Glaciation, and probably prior to or perhaps during the time of man's first arrival.

The lower beds of the alluvial fan were deposited during conditions of intermittent stability/instability in the small catchment, but the upper beds of the fan sequence are devoid of organic materials and accumulated under conditions of general surface instability in the catchment when the local vegetation cover of the steep slopes was markedly reduced. The upper beds of fan gravel were deposited by a stream which was supplied with abundant angular quartzite fragments from mobile slope deposits. These were probably mainly produced by frost shattering of exposed rock surfaces in winter. The ^{14}C dates and local stratigraphy indicate that this phase of major landscape instability post-dates 24,000 BP and pre-dates the Holocene.

There is extensive geomorphological evidence in lowland northwestern Tasmania to demonstrate that during the later part of the Last Glacial Stage soil and regolith mantles were very mobile on steep slopes (> 10-15°), and that where bare rock was exposed strong physical weathering processes produced angular fragmental rubbles of chemically unweathered rock. Under conditions of lowered temperatures, decreased precipitation, and reduced vegetation cover, strong winter freezing of soil and surface moisture would fracture the exposed rock and subsequent thawing would cause the downslope movement of loosened materials by gelifluction processes. Deposits so formed have been found in dolerite, basalt, quartzite and chert areas and include gelifluction deposits, stratified screes and *grèzes litées*. Inversion of old soil profiles and regolith mantles, with the addition of freshly derived angular detritals near the surface, demonstrates the sequential stripping of steep slopes as the cold climatic conditions of the later part of the Last Glacial Stage endured. Stripping of the soil mantle at Sayers Hill in the lower Forth Valley probably commenced before 30,000 BP as indicated by a > 30,600 BP (GaK-5590) assay on charcoal contained in an inverted paleosol which underlies schist and quartzite gelifluction deposits (Colhoun, 1976). Similar inverted soil and regolith sequences are known from Mersey Bluff near Devonport and Westbank Hill near Penguin when they occur in association with dolerite and quartzite rocks respectively (Figure 3) (Chick and Colhoun, 1972). That widespread instability and movement of materials continued on steep slopes until the commence of the Holocene is supported by a ^{14}C assay of 13,870 ± 820 BP (GaK-5968) on charcoal at 190 cm depth in a stratified slope deposit composed of 0.5 to 3 cm long angular fragments of chert, shale and quartzite at Hardstaff Creek in the Leven Valley.

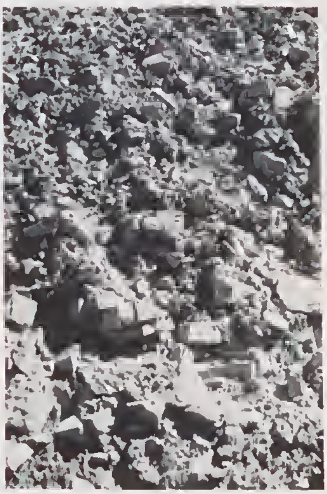

Figure 3 Quartzite gelifluction deposits at Westbank Hill near Penguin

There is evidence for the formation of terrestrial sand dunes with a predominantly west to east orientation on the Woolnorth Estate of the far northwest. A small area of terrestrial dunes occurs at Edith Creek 14 km south of Smithton, and a shallow lagoon bounded on its eastern margin by a lunette occurs at Smokers Bank 2 km southeast of Smithton (Figure 4) (van de Geer, pers. comm.). These terrestrial dunes and lunette are the most northwesterly known in Tasmania and resemble dunes described from the midland valley and northeastern Tasmania (Nicolls, 1957; Davies, 1967; Bowden, pers. comm.). They are considered to indicate at least seasonally very dry conditions during the later part of the Last Glaciation (Colhoun, 1975).

Although continuity of evidence has yet to be presented, one migration route which could have been followed between northern and southeastern Tasmania during the late Pleistocene would have been via the Midland Valley to the lower Derwent Valley. Biogeographic and geomorphologic evidence has recently become available for the southern part of the midlands and the lower Derwent Valley and allows a partial reconstruction of the paleoecological and paleoclimatic conditions that prevailed during the time of man's first occupance of southeastern Tasmania.

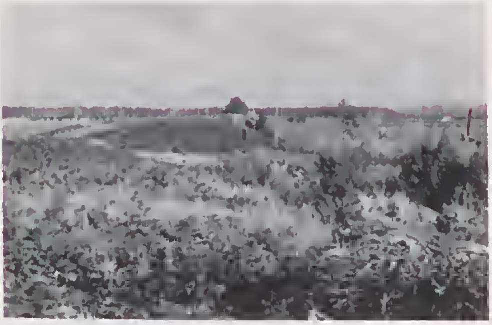

Figure 4 Terrestrial sand dune of late Last Glacial age at Edith Creek.

SOUTHEASTERN AND SOUTHWESTERN TASMANIA

Pollen analysis of thin organic sediments associated with the beginning of a major phase of surface instability and aeolian sand deposition at Pipe Clay Lagoon, South Arm indicates that between 25,420 ± 460 BP and 19,840 ± 280 BP (SUA-151 and SUA-153) there was a reduction in pollen of *Eucalyptus* spp. from 73% to 4% with marked increases in Gramineae (8 to 19-24%), Compositae (3 to 5-11%) and Cyperaceae (2-66%) (Figure 5). The pollen changes probably indicate a change from *Eucalyptus* woodland to more open *Eucalyptus* savannah or grassland, which may have been caused by an increase in the intensity of the colder and drier climatic conditions of the maximum phase of the Last Glacial Stage.

In the southern part of the midlands a 283 cm core from Lake Tiberias has revealed a late Quaternary vegetation sequence of three units (Macphail, pers. comm.).

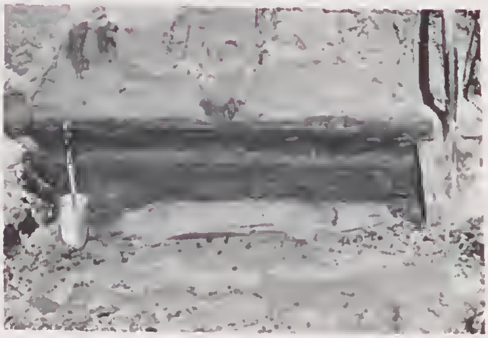

Figure 5 Organic beds overlying marine sands and buried by aeolian sands at Pipe Clay Lagoon. Note the laminated character of the upper organic stratum which accumulated after the commence of aeolian activity.

Unit	Depth	
3	0.205 cm	Dominated by *Eucalyptus* spp. (70-80%) throughout but with significant amounts of *Pomaderris apetala-Spyridium* type pollen above 184 cm and *Casuarina* in the upper third of the unit.
2	210 -250 cm [∿ 215 220 cm] [9550 ± 200 BP (GaK-2239)] [Goede, 1968, unpublished]	Dominated by *Eucalyptus* spp. (30-60%) but characterized by maximal percentages of *Phyllocladus aspleniifolius* (38%), *Dicksonia antarctica* (10%), Compositae (5%), with considerable Chenopodiaceae (8-20%).
1		Characterised by Chenopodiaceae (30%) and Gramineae spp. (20%), with *Eucalyptus* spp. (25%) and *Phyllocladus aspleniifolius* (15%).

This sequence is interpreted as illustrating the replacement of a sparse steppe-grassland association in late glacial times by a mosaic of *Eucalyptus* dry sclerophyll woodland and *Poa-Eucalyptus* savannah-woodland in the Holocene. These vegetation associations, although influenced by fire and aboriginal burning, are regarded as being ecologically adjusted to the present numerous winter frosts and marked summer drought conditions of the southern midlands. The significant component of *Pomaderris apetala-Spyridium* type pollen is interpreted as indicating moister conditions prior to and during the mid-Holocene (∿ 8,000 to 3,600 BP). The increase of *Casuarina* is interpreted as indicating slightly drier and cooler conditions during the late Holocene (after ∿ 3,600 BP) even though the input of pollen from both groups is regarded as being of non-local origin (Macphail, 1975a).

Pollen analysis of a core of lake clay from Crown Lagoon 20 km east of Oatlands demonstrates a co-dominance of *Eucalyptus* and Gramineae spp. (∿ 20% each) in the surface 30cm. This is preceded by a strong maximum and dominance of Gramineae spp. (20-47%) with abundant Chenopodiaceae (20-30%) between 30 and 80 cm depth. Although it has not been possible to ^{14}C calibrate this sequence the surface two zones mentioned here are clearly biostratigraphic correlates of local zones 1 and 3 at Lake Tiberias. The pollen profile indicates that a late Last Glacial steppe-grassland was replaced by *Eucalyptus* savannah-woodland during the early Holocene (Sigleo, pers. comm).

Pollen studies of cirque lake sediments at Adamsons Peak; Tarn Shelf, Eagle and Beatties tarns at Mt. Field; and in the glaciated Lake Vera east of Frenchmans Cap indicate that before ∿ 11,500 BP alpine grasslands and herbfields were widespread and that these were successively replaced in late glacial and early Holocene times (∿ 11,500 to 8,000 BP) by an expansion and regional upslope migration of alpine coniferous and sclerophyll heath, subalpine mixed woodland with *Eucalyptus*, and temperate rainforest. It is suggested that there was a relatively rapid increase in temperature and precipitation between ∿ 11,500 and 9,500 BP, and that the rising *Eucalyptus* climatic timberline, defined by the summer 10°C isotherm, maintained a west to east gradient sub-parallel to modern climatic timberline as climatic conditions improved towards an 'optimum' between 8,000 and 5,000 BP. The optimum may have been slightly warmer and moister than the succeeding climate which may have been slightly cooler and drier. Macphail (1975b) points out that any such fluctuations of Holocene climate were extremely small and that no major change occurred after the main late glacial-early Holocene period when temperature and precipitation increased fairly rapidly.

In southeastern and southwestern Tasmania there are three kinds of widespread geomorphological evidence from which it is possible to make some interpretations relating to climatic changes viz., periglacial forms and slope deposits, aeolian dunes and alluvial deposits.

The widespread occurrence of screes, blockfields, blockstreams, talus and geliflucion deposits above 450 m was taken by Davies (1967, 1974) to indicate that periglacial processes which caused fracturing and downslope movements of rock debris were general on the high ground of both southeastern and southweste Tasmania during the Last Glaciation. In addition, rhythmically stratified screes and *grèzes litées* have recently been found in several localities. Collectively these deposits indicate general instability of the ground surface induced by severe winter frost conditions and indicate that the Last Glacial tree line occurred below 450 m. Recent research has shown that on steep slopes and on brittle rock types which are already strongly fractured, gelifluction, rhythmically stratified screes and *grezes litées* have a discontinuous distribution down almost to sea level (Figure 6). This distribution suggests that mean annual temperature depression was probably greater than the 5°C estimate of Davies and may have been approximately 8°C. It also implies that the boundary of the climatic timberline was not regular and locally at least la well below 450 m. The mosaic of areas of unstable slope deposits and more stab surfaces at low elevation probably maintained a mosaic of vegetation associatio adjusted to different combinations of habitat variables rather than a continuou forest cover and stable ground surface.

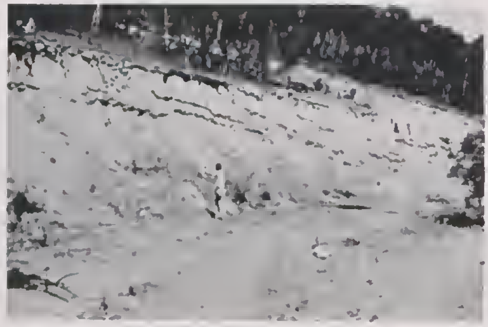

Figure 6 Rhythmically stratified scree deposits in Permian mudstones and sandstones near New Norfolk.

Radiocarbon dates of > 40,000 BP (I-8155, Wasson pers. comm.) on charcoal from a paleosol that separates an underlying gelifluctate from overlying *grezes litees* at Ferntree, Mt. Wellington and an assay of > 37,000 BP (SUA-309) on charcoal and wood fragments in gelifluction deposits at Gellibrand Point, South Arm demonstrate that more than one major generation of gelifluction deposits occurs in southeastern Tasmania. The latest and most widespread generation is of late Last Glacial age during which movements of deposits continued until after 14,200 ± 700 BP (GaK-486) (Davies, 1974), as indicated by the superposition of a gelifluction deposit on a paleosol in the Florentine Valley of southwestern Tasmania.

On both sides of the lower Derwent Valley there are numerous areas of low sand dunes and in the southern midlands lunettes occur on the eastern margins of Lake Tiberias and Crown Lagoon. Nicolls (1957, 1958) considered that the low dunes of the Derwent Valley and lunettes of the northern midlands were produced by deflation of fine sands from river and lake beds, and alluvial terraces by westerly winds in the drier eastern part of Tasmania during the Last Glaciation. Davies (1967) suggested the possibility that some of the dunes were either formed or modified during a more arid phase in the mid Holocene. Many dunes adjacent to rivers and lakes were aboriginal occupation sites, and where they have been studied at Crown Lagoon, Old Beach, Bridgewater and Glenfield (Sigleo and Colhoun, 1975; Sigleo, 1976) the evidence indicates that man was mainly responsible for the disturbance and modification of the dune forms in mid and late Holocene times. A ^{14}C date of 15,740 ± 700 BP (SUA-376) from a dunefield at Malcolms Hut Road near Richmond, which was not an aboriginal occupation site, supports a late Last Glacial age for the widespread aeolian erosion and deposition that formed the primary dunes.

One of the most impressive geomorphological characteristics of southeastern Tasmania is the great number of small valleys with thick alluvial deposits. Studies of the Tea Tree Rivulet by Goede (1965, 1973) showed that there was strong alluviation of the valley floor between 6,200 ± 200 BP (GaK-1146) and 3,040 ± 90 BP (GaK-1677), as indicated by substantial quantities of charcoal in the deposits. Goede suggested that the increased alluviation could have been the result of warmer and drier conditions in the mid Holocene. He also recognised the presence of reddish horizons of burnt clay and found an aboriginal artifact in the alluvial sediments (Figure 7). These facts indicate that aboriginal man was certainly influential in causing the increased alluviation and must lead to a reconsideration of whether the increased alluviation is really a response to climatic change or not.

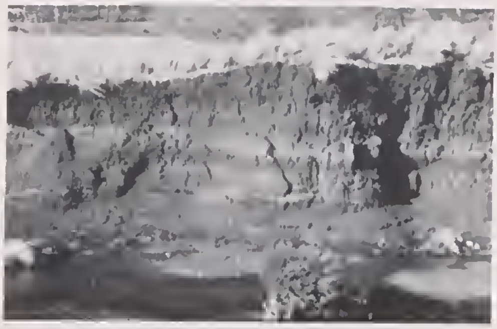

Figure 7 Alluvial clays showing fire horizons in the Tea Tree Rivulet

Similar alluvial deposits in the Barilla Valley east of Hobart contain charcoal horizons that have been dated to 1,160 ± 100 BP (GaK-651) (Stephens, pers. comm.), 4,650 ± 120 BP (GaK-488) and 7,900 ± 460 BP (GaK-487) (Davies, 1967, 1974). Davies suggests that the alluviation of the Barilla Valley was due to aboriginal burning and to slightly warmer and drier climatic conditions in the mid Holocene than at present. While it is easy to substantiate the occurrence of fire in these catchments, it is difficult to demonstrate from geomorphological evidence that a significant climatic trend towards warmer and drier conditions occurred.

Many valleys in southeastern Tasmania contain alluvial sediments and fan deposits of Last Glacial age as well as of Holocene age. Similar alluvial fan deposits are also known from along the Gordon and Scotts Peak roads in southwestern Tasmania where they are associated with scree and gelifluction deposits. Further investigation of these alluvial fills and fan deposits is needed not only to determine the quantities of Holocene and Pleistocene deposits but also to differentiate the changing conditions of alluvial sedimentation in response to both climatic changes and culturally induced changes of vegetation cover.

CONCLUSIONS

The biogeographic and geomorphologic evidence discussed indicates that when aboriginal man entered northern Tasmania and migrated southwards, mean temperatures may have been as much as 8°C lower than present values; precipitation was probably significantly reduced over the whole state, and vegetation formations were much more open than the forested conditions seen by the first Europeans. The evidence indicates that the same climatic gradients existed then as today, with more humid maritime conditions prevailing in the mountainous southwest than in the drier continental conditions of the northern, midland and eastern areas of the state. The apparent widespread extent of alpine grassland and herbfield in the southwest was probably a response to decreased temperatures which also influenced the geomorphic processes that resulted in the widespread production of scree, blockfield, blockstreams and gelifluction deposits on high ground. The apparent widespread extent of grassland and steppe-grassland on the northwest lowlands and midlands was probably a response to aridity which also contributed to the formation and widespread occurrence of low sand dunes and lunettes.

The contemporaneous production of periglacial and associated slope deposits with aeolian and alluvial deposits in the same regions during the late Last Glacial stage suggests that seasonal variations of climate were geomorphologically more effective than during the Holocene. Severe winter frosts caused strong physical weathering and facilitated downslope movement of rock debris on high ground and steep non-forested slopes. Snow cover augmented flooding in spring which, in a landscape of unstable slope materials and reduced vegetation cover, caused severe erosion of surficial deposits and their deposition as fans or thick alluvial fills at the exits and in the floors of the valleys. After the spring floods, strong summer drought conditions prevailed over northern and eastern Tasmania and permitted wind erosion of sands and clays from bare surfaces, dried up river beds, lake beaches and exposed lake floors. The transported sands and clays were deposited on vegetated areas leeward of their sources. The greater efficiency of these seasonally induced geomorphological processes in the extraglacial regions of northern, midland and southeastern Tasmania during the Last Glaciation suggests that there may have been larger seasonal ranges or greater short period variability of both temperature and precipitation under conditions of increased continentality than under the more maritime conditions of the Holocene. This suggestion needs further investigation as the effects may to some extent be the product of increased efficiency of erosional processes because of reduced vegetation cover, which would act in the same direction and increase any effects of greater seasonal variation or short term variability of temperature and precipitation parameters.

In these environments aboriginal man would have moved freely over the landscape and could have migrated rapidly to eastern and southeastern Tasmania after he first arrived in the region. Although only three sites of Pleistocene age are presently known it is to be expected that the drier northern, midland and southeastern lake and riverine sites would be preferred to the colder alpine montane environments of the southwest. However the evidence of Goede and Murray shows that aboriginal man at least made journeys into the southwest during the late Pleistocene.

The biogeographic evidence from Lake Tiberias, Crown Lagoon and the mountain cirque lakes of the southwest studied by Macphail (1975a, b) and Sigleo (pers. comm shows that there was a rapid increase of temperature and probably also of precipitation at the commencement of the Holocene. This was accompanied by the rapid expansion of *Eucalyptus* forest in eastern Tasmania and a rapid expansion through alpine sclerophyll shrubs, alpine mixed forest to temperate rain forest in southwestern Tasmania during the early Holocene. The combined effects of the climatic changes and forest expansion was to cause a decrease in the intensity and erosional efficiency of terrestrial geomorphic processes. The likely action of aboriginal man, using his chief agent fire, would be to contest the forest encroachment on his open environment. Evidence for significant climatic changes during the middle and late Holocene is equivocal, but the widespread presence of charcoal in sediments suggests that extensive firing of scrub and forest by aboriginals may have been sufficient to induce periodically high rates of erosion and cause alluviation in the valleys of eastern Tasmania.

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